DIOXIN TMDL FOR TISDALE BRAKE, STAULKINGHEAD CREEK, LITTLE BAYOU BEOUF, WHAM BRAKE, AND BAYOU LAFOURCHE

SUBSEGMENTS 080912 and 080904

TMDL Report

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 6, DALLAS, TX

and the

Louisiana Department of Environmental Quality
Office of Environmental Assessment

Prepared by:

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8000 Centre Park Dr., Suite 200
Austin, Texas 78754

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act (CWA) requires states to identify water bodies that are not meeting state water quality standards and to develop total maximum daily pollutant loads for those water bodies. A total maximum daily load (TMDL) is the amount of pollutant a water body can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the water body.

To meet this requirement of the CWA, the Louisiana Department of Environmental Quality (LDEQ) has scheduled completion of TMDLs in the Ouachita River Basin for 2002 and is relying on EPA Region 6 to assist in the completion of some of these TMDLs. Wham Brake and Bayou Lafourche (Subsegment #080904), which are located in the Ouachita River Basin in northeast Louisiana, were placed on the October 28, 1999 Court Ordered §303(d) List as a result of fish consumption advisories issued by Louisiana Department of Health and Hospitals (LDHH) in 1987, 1994, and 2001 (LDHH 1993a; 1993b). This report documents the data and assessment utilized to establish a TMDL for dioxin, in accordance with requirements of Section 303(d) of the CWA and U.S. EPA guidance. As part of this TMDL Report, it is necessary to also assess Subsegment 080912 (Tisdale Brake/Staulkinghead Creek) in order to address the primary source of dioxin in the watershed – the International Paper's (IP) Louisiana mill (NPDES permit number LA0007561). IP outfall 001 discharges into Staulkinghead Creek which then joins Little Bayou Beouf, which then flows into Wham Brake. The only known source of dioxin loading to Wham Brake and Bayou Lafourche is that of IP outfall 001.

Louisiana's water quality standards [Title 33 Environmental Regulatory Code Part IX, 1113, C.6.c] for dioxin are applied as follows:

> *"Criteria for human health are derived using EPA guidelines, procedures, and equations for water bodies used as drinking water supplies and those not used as drinking water supplies. Criteria for water bodies not designated as drinking water supplies are developed to protect them for primary and secondary contact recreation and to prevent contamination of fish and aquatic life consumed by humans. In some cases, the maximum contaminant levels (MCLs) from the National Drinking Water Regulations, when more restrictive, are used as the criteria. For those toxic substances that are suspected or proven carcinogens, an incremental cancer risk level of 10^{-6} (1 in 1,000,000) is used in deriving criteria, with the exception of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and hexachloro-cyclohexane (lindane, gamma BHC), in which case 10^{-5} (1 in 100,000) is used to derive the criteria."*

LDEQ data were analyzed based on LDHH risk assessment methodology for dioxin levels in fish for Wham Brake and Bayou Lafourche, and to identify an acceptable screening or action level for dioxin in edible fish tissue.

These TMDLs were developed based on LDEQ implementation procedures for the Human Health Criteria for Staulkinghead Creek using harmonic mean flow and the State standard for the dioxin congener 2,3,7,8-TCDD of 0.72 parts per quadrillion (ppq). No data are available to quantify whether nonpoint source loadings of dioxin occur within the watershed. The TMDL calculation, which is 60.14 micrograms per day (µg/day), includes a wasteload allocation and an explicit margin of safety of 20%.

The following table summarizes the TMDL calculations results.

Table ES-1
Results

Annual Average Flow	20.6 cfs
Estimated HM Flow	5.15 cfs
7Q10	1.79 cfs
Permitted Effluent Flow	40.4 cfs
	Creek Human Health Effluent Dilution
% Effluent	88.7 %
TMDL Calculations	
Current Load	*
Waste Load Allocation	80.2 µg/day
MOS (20% of TMDL)	20.1 µg/day
Load Allocation	0 **
TMDL	100.3 µg/day

* Unknown current load due to nondetect in effluent over last 5 years.
** No adequate ambient environmental data to quantify nonpoint source pollutant loadings.

The fish consumption advisories are expected to be removed in time since modified production processes at IP, including elemental chlorine free (ECF) bleaching technology, have been in place at least since 1994 and are in compliance with Best Available Technology (BAT) standards. Dioxin concentrations are also expected to decline as a result of natural attenuation.

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ACRONYMS AND ABBREVIATIONS

µg/day	Micrograms per day
BAT	Best available technology
CDD	Chlorinated dibenzo-p-dioxin
CDF	Chlorinated bidenzofurans
cfs	Cubic feet per second
CWA	Federal Clean Water Act
ECF	Elemental chlorine free
EPA	U.S. Environmental Protection Agency
LA	Lead allocation
LDEQ	Louisiana Department of Environmental Quality
LDHH	Louisiana Department of Health and Hospitals
LP	Louisiana Paper
mg/L	Milligrams per liter
MOS	Margin of safety
pg/g	Picograms per gram
ppq	Parts per quadrillion
QA/QC	Quality Assurance/Quality Control
TEQ	Toxicity equivalent
TMDL	Total maximum daily load
WLA	Wasteload allocation

SECTION 1
INTRODUCTION

To meet the requirement of Section 303(d) of the CWA, LDEQ has scheduled completion of TMDLs in the Ouachita River Basin for 2002 and is relying on EPA Region 6 to assist in the completion of some of these TMDLs. Wham Brake and Bayou Lafourche (Subsegment #080904), located in the Ouachita River Basin in northeast Louisiana, were placed on the October 28, 1999 Court Ordered §303(d) List as a result of fish consumption advisories issued by Louisiana Department of Health and Hospitals (LDHH) in 1987, 1994, and 2001 (LDHH 1993a; 1993b). This report documents the data and assessment utilized to establish a TMDL for dioxin in accordance with the requirements of Section 303(d) of the Clean Water Act and U.S. EPA guidance. As part of this TMDL Report Subsegment 080912 (Tisdale Brake/Staulkinghead Creek) is also being assessed which is necessary to address the primary source of dioxin in the watershed – the International Paper's (IP) Louisiana Mill (NPDES permit number LA0007561).

The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant. The TMDL consists of the wasteload allocation (WLA), a load allocation (LA), and a margin of safety (MOS). The WLA is the fraction of the total load apportioned to point sources. The LA is the fraction of the total load apportioned to nonpoint sources. The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

SECTION 2
STUDY AREA DESCRIPTION

2.1 OUACHITA BASIN

The headwaters of the Ouachita River are found in the Ouachita Mountains in west central Arkansas, near the Oklahoma border. The Ouachita River flows south through northeastern Louisiana and joins the Tensas River to form the Black River, which empties into the Red River. The Ouachita River Basin (Basin 8) covers over 10,000 square miles of drainage area within the State of Louisiana. Most of the basin consists of rich, alluvial plains cultivated in cotton and soybeans. The northwest corner of the basin is a commercially-harvested pine forest (LDEQ 1996).

2.2 BAYOU LAFOURCHE WATERSHED, SUBSEGMENT 080904

To adequately address dioxin sources contributing to the fish consumption advisory in Wham Brake and Bayou Lafourche (Subsegment 080904), it was necessary to consider the hydrologic connection of dioxin sources upstream of Wham Brake in this assessment (see Figure 2.1).

Effluent from IP outfall 001 (NPDES permit #LA0007561) discharges into Staulkinghead Creek (an intermittent stream), which then joins Little Bayou Beouf, which then flows into Wham Brake. The drainage basin of Staulkinghead Creek upstream of the plant outfall is approximately 18.5 square miles (Woodward-Clyde 1991). The runoff-induced streamflow, an estimated average annual flow of 20.6 cubic feet per second (cfs), provides dilution of plant discharges into Staulkinghead Creek. There has never been a stream gauge at Staulkinghead Creek (Woodward-Clyde 1991).

Wham Brake is a low swamp, approximately 6 square miles in area, (partially leveed) which has a controlled outflow to Bayou Lafourche. Wham Brake forms the partial border of Ouachita and Morehouse Parishes as it meanders toward its confluence with Bayou Lafourche (Subsegment 080904), which forms the partial border of Ouachita and Richland Parishes.

Under its permit, IP monitors dioxin and controls the flow from Wham Brake to Bayou Lafourche. There is typically no discharge to Bayou Lafourche from Wham Brake during the summer and fall.

Due to the large surface area of Wham Brake, evaporation rates keep up with the flow from Staulkinghead Creek/Bayou Beouf and there is very little gain in the water level. Summertime overtopping of the Wham Brake outlet control occurs only rarely if a very high rainfall event occurs (such as from a tropical storm). Discharge from such an event would be expected to be primarily stormwater. Flow from Wham Brake typically resumes in the late fall-early winter. Bayou Lafourche has an estimated average annual flow of 1,905 cfs, which

is based on U.S. Geologic Survey (USGS) gage station 07369000 near Crew Lake, LA (USGS Web Site).

Average annual precipitation in the watershed, based on the nearest Louisiana Climatic Station, is 52 to 52.5 inches based on a 30-year record (Louisiana State University 2000) (see Figure 2.2). Land uses in the Bayou Lafourche watershed are shown in Table 2.1 (LDEQ 2000). These land use figures were derived from 1999 USGS GAP database. The watershed is predominantly agricultural land (59.61 percent) and wetlands (22.44 percent). Figures 2.3 through 2.6 are shown sequentially from upstream to downstream.

Table 2.1 Aggregate Land Use Summaries for Entire Bayou Lafourche Watershed

Land Use	Total Acres	Percent Total
Wetlands	81,263.42	22.44
Forest land	35,025.27	9.67
Rangeland	16,15.91	0.45
Agricultural land	215,903.39	59.61
Urban or built-up land	6,031.99	1.67
Barren	224.17	0.06
Water	22,102.62	6.10
Total	362,166.78	100.00

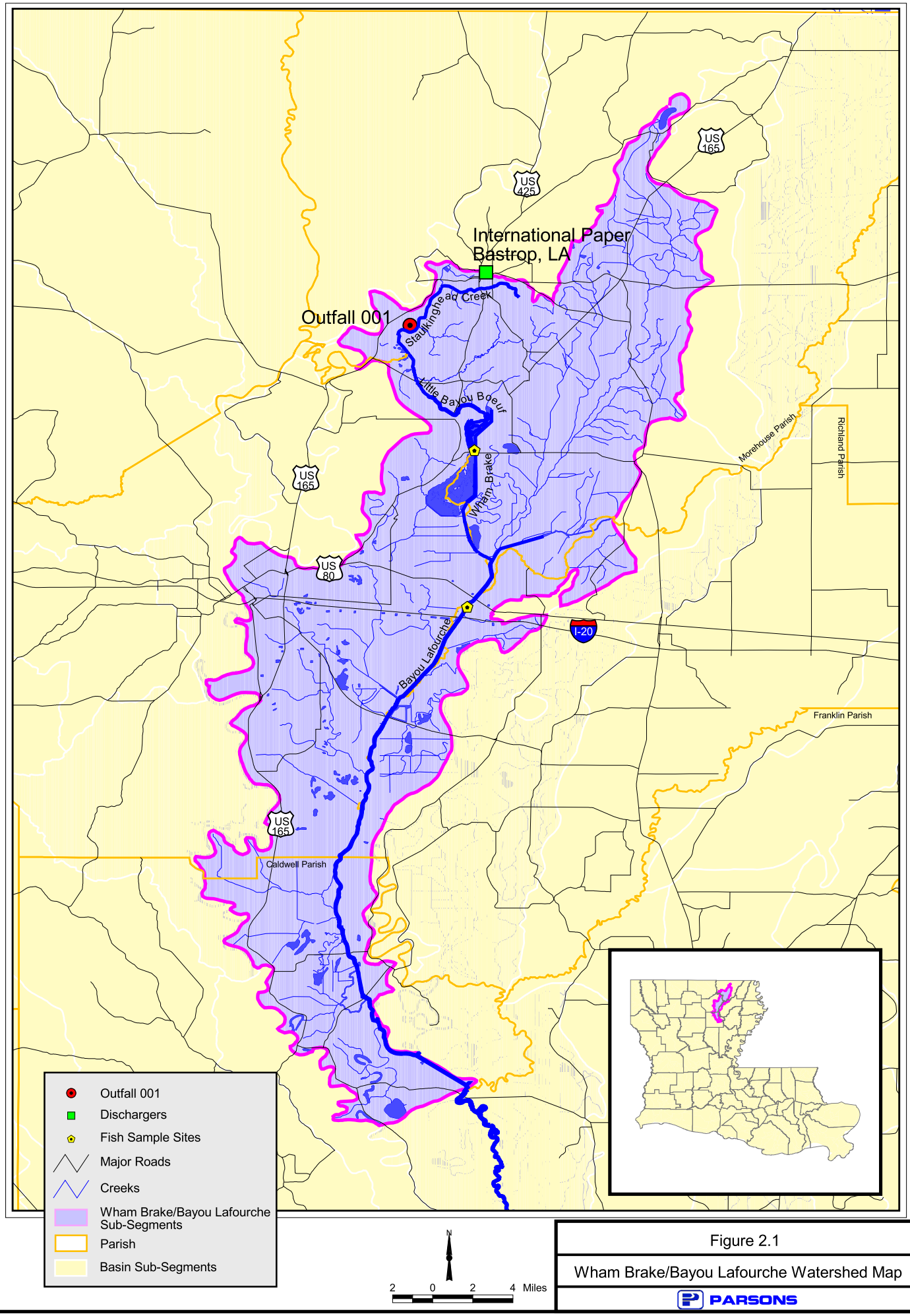

Figure 2.1

Wham Brake/Bayou Lafourche Watershed Map

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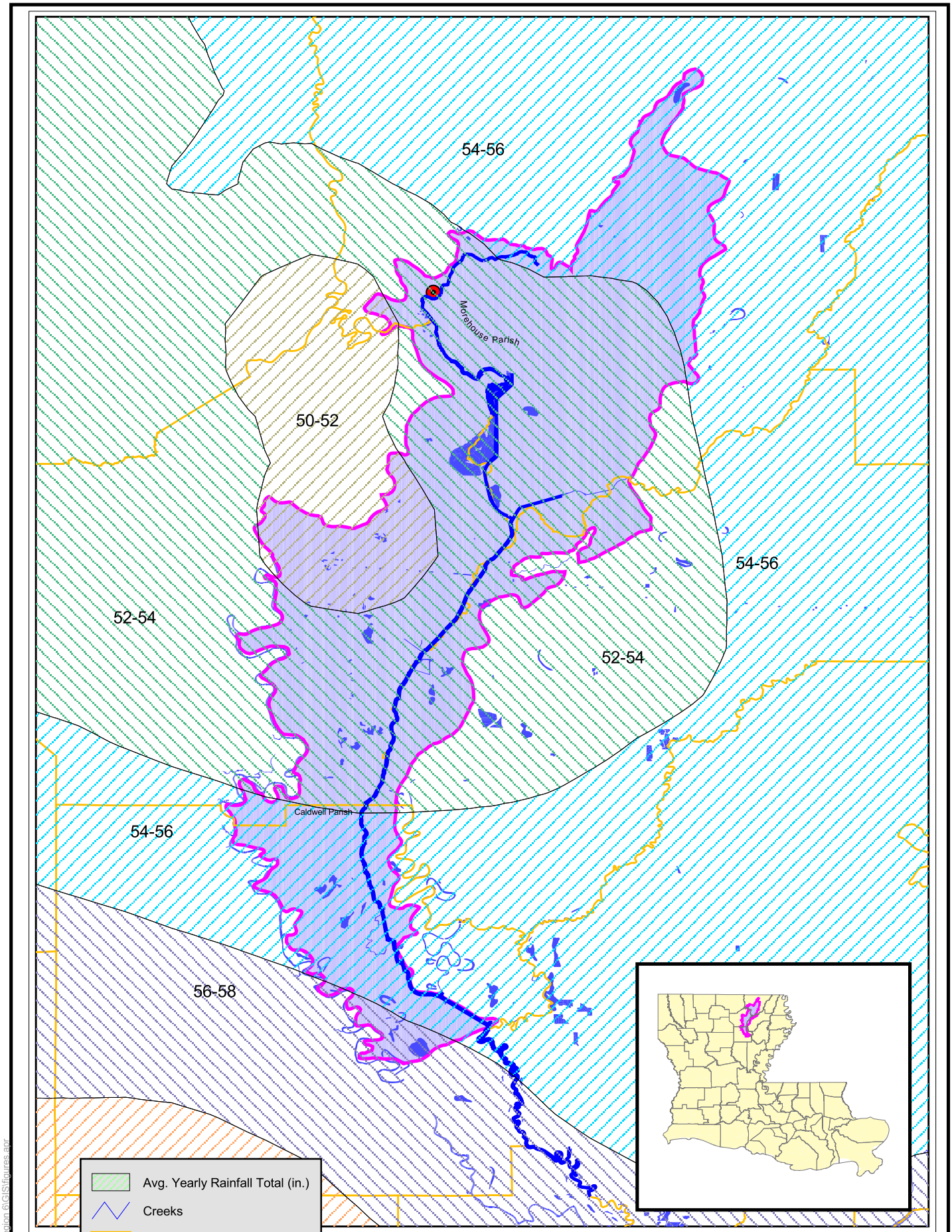

Source: Louisiana Average Yearly Precipitation, 1961-1990
Water and Climate Center of the Natural Resources Conservation Service

Figure 2.2

Wham Brake/Bayou Lafourche Watershed Rainfall

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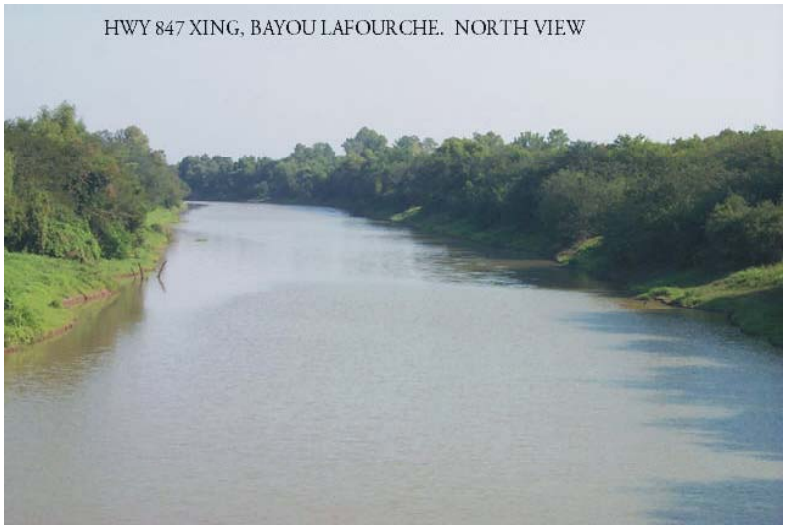
Figure 2.3
Staulkinghead Creek, North of Naff Ave., Bastrop, LA

Figure 2.4
Staulkinghead Creek, South of Naff Ave., Bastrop, LA

Figure 2.5
Bayou Lafourche, I 20, LA

Figure 2.6
Bayou Lafourche, HWY 847, LA



SECTION 3
PROBLEM DEFINITION AND ENDPOINT IDENTIFICATION

3.1 PROBLEM DEFINITION

The purpose of this TMDL Report is to meet requirements of CWA Section 303(d), which requires LDEQ or the U.S. Environmental Protection Agency (EPA) to develop a pollutant load allocation for each pollutant identified on the State's EPA-approved 303(d) List. LDEQ's 1999 303(d) List included dioxin as a pollutant of concern in Tisdale Brake/Staulkinghead Creek, Wham Brake, and Bayou Lafourche. More importantly, however, the basis of the listing for Wham Brake and Bayou Lafourche are the 1987 and 1994 (respectively) fish consumption advisories issued by the LDHH (LDHH, 1993a, 1993b). These advisories were reconfirmed in a memo released by LDHH on November 28, 2001 which is provided in Appendix A.

Wham Brake and Bayou Lafourche were included in the National Study of Chemical Residues in Fish (EPA 1992). Fish samples were collected and analyzed for dioxin in Wham Brake (Episodes 3087 & 3425) and Bayou Lafourche (Episode 3353) during 1986 and 1987. Ten fish were sampled comprising several species (Table 3.1).

Although the Dioxin concentration levels from the six whole body fish samples are not directly comparable to the human health screening levels; however, results from all four fillet samples taken from both waterbodies ranged between 6.73 picogram per gram (pg/g) and 56.33 pg/g which exceed the LDHH screening level of 1.56 pg/g and the EPA (2.56 pg/g) screening criteria. These data ultimately resulted in fish consumption advisories being issued for both water bodies resulting in the listing of Wham Brake and Bayou Lafourche on the State's 303(d) List.

While the rationale for placing Wham Brake and Bayou Lafourche on the 303(d) List has been substantiated by the LDHH fish consumption advisories, no data are available to ascertain whether dioxin is impairing a beneficial use in Tisdale Brake or Staulkinghead Creek. No fish consumption advisory has ever been issued for Tisdale Brake or Staulkinghead Creek. However, to comply with the requirements of Section 303(d), it is necessary to account for the only known source contributing dioxin loading to Wham Brake and Bayou Lafourche; therefore, both Tisdale Brake and Staulkinghead Creek are also addressed in this TMDL Report.

To focus the technical assessment of this report, it was agreed that since Tisdale Brake is located upstream of the only known source of dioxin (IP Outfall 001), it would not be necessary to establish a dioxin TMDL specific to that water body. However, for this report to adequately address dioxin loadings to Wham Brake and Bayou Lafourche, assessment of the limited available data on Staulkinghead Creek and various assumptions were made to establish a TMDL for Staulkinghead Creek and Bayou Lafourche which would protect downstream water bodies.

Table 3.1 Wham Brake and Bayou Lafourche Bioaccumulation Results

Wham Brake

Episode 3087				Episode 3425			
Species	Sample type		Dioxin Level	Species	Sample type		Dioxin Level
Carp	WB	pg/g	157.87	Carp	WB	pg/g	180.32
White Crappie	F		22.98	Channel Catfish	F		56.33
Bluegill	WB		75.95				
LM Bass	WB		22.17				
White Crappie	F		25.93				
Bluegill	WB		82.18				

Bayou Lafourche

Episode 3353			
Species	Sample type		Dioxin Level
Blue Catfish	BF	pg/g	6.73
Sm Buffalo	WB		8.63

WB-Whole body
F- Fillet

Source: USEPA. 1992. National Study of Chemical Residues in Fish – Volumes 1&2.

Fish data for this analysis were obtained from EPA Region 6 and IP and evaluated to determine whether the fish consumption advisories for Wham Brake and Bayou Lafourche are still warranted. All fish collection and tissue analysis conducted by IP followed EPA-prescribed quality assurance (QA) methods. Dioxin test results were obtained using EPA 1613 test procedure or the equivalent NCASI procedure. The tests were run using appropriate blanks, replicates, and spikes according to the established QA and quality control (QA/QC) procedures for the test method. The fish data were composite samples of three to 10 fish (mostly five or six fish per sample with some exceptions) with a target collection of as similar a size as practical (within +/- 15 percent length of each fish in a target species). Lab analysis of fish was conducted by Triangle Lab through 1998, and after that, ALTA Lab provided analysis. The fish samples were tested on a wet weight basis (as is).

Yearly fish samples have been collected from two separate locations, one at Wham Brake and another at Bayou Lafourche (Table 3.2; Figure 3.1). At both Wham Brake (Figure 3.2) and Bayou Lafourche (Figure 3.3), past dioxin levels (prior to 1994) greatly surpassed LDHH screening levels. Following 1994 a precipitous decline in average dioxin occurred followed by an increase in recent years. The most recent data for both sampling locations indicate fish tissue concentrations of dioxin were near or slightly over the LDHH screening level of 1.56 pg/g (Figure 3.4).

Table 3.2 Annual Average Dioxin Level of all Fish Species

Wham Brake					Bayou Lafourche				
Year	Average Dioxin TEC (pg/g)	Total Number of Samples	Number of Sample Dates	Number of Species	Year	Average Dioxin TEC (pg/g)	Total Number of Samples	Number of Sample Dates	Number of Species
1987	21.24	1	1	1	1987	5.22	2	1	2
1989	44.93	2	2	2	1989	5.57	4	1	4
1990	27.38	4	1	4	1990	9.36	8	2	5
1991	29.14	5	1	5	1991	4.44	5	1	5
1992	15.91	4	1	4	1992	4.22	5	1	5
1993	9.32	2	1	2	1993	2.64	5	1	4
1994	5.52	2	1	2	1994	2.67	4	1	4
1995	3.90	1	1	1	1995	1.00	4	1	2
1996	8.25	2	1	2	1996	0.45	2	1	2
1997	2.30	2	1	2	1997	0.90	2	1	2
1998	3.73	4	1	4	1998	1.60	2	1	2
1999	2.45	2	1	2	1999	0.60	2	2	2
2000	9.45	2	1	2	2000				
2001	2.60	2	1	2	2001	3.1	1	1	1

FIGURE 3.1
INTERNATINAL PAPER LOUISIANA MILL
SAMPLING STATION LOCATION MAP
(Not To Scale)

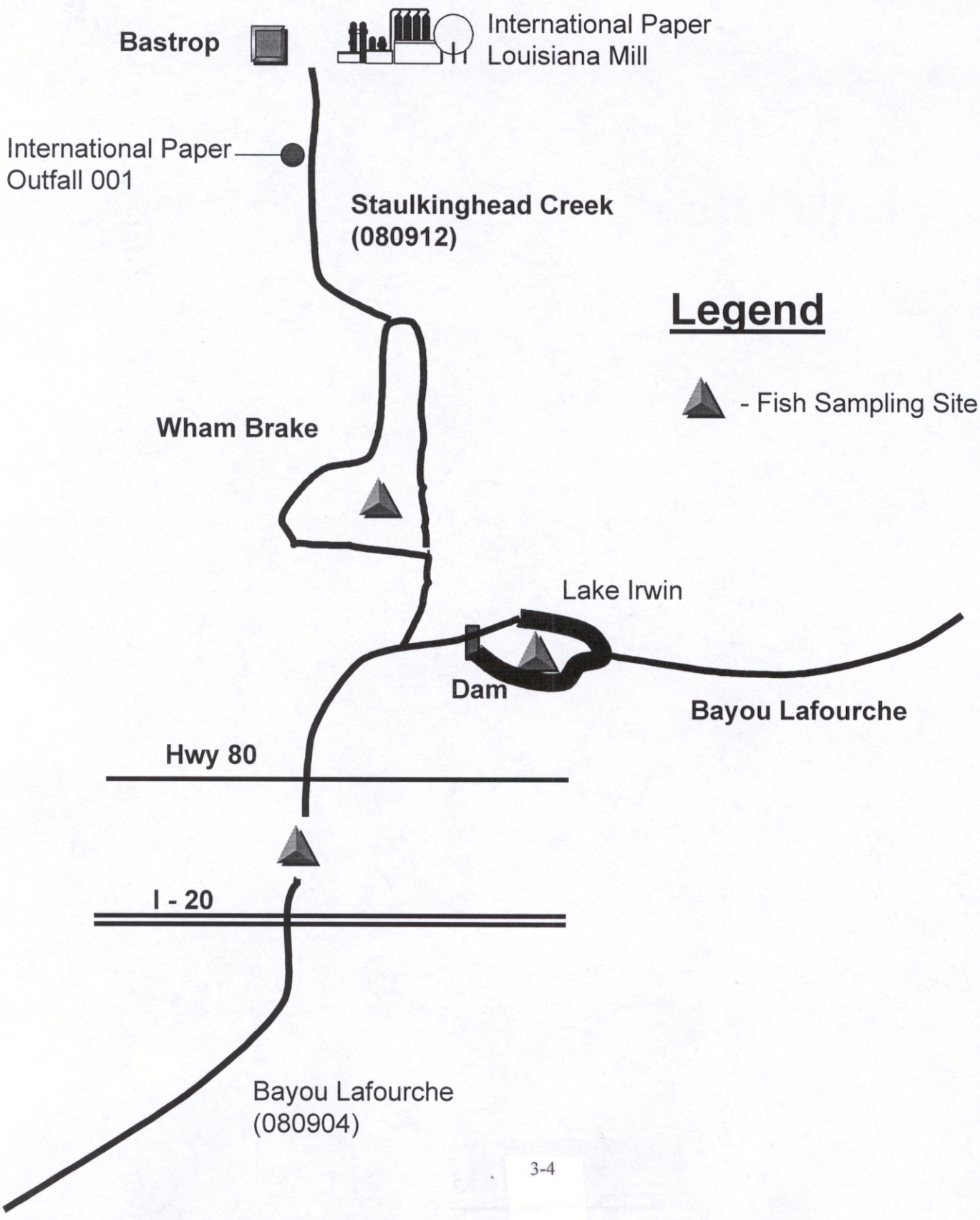


Figure 3.2 Annual Average Fish Tissue Dioxin, Wham Brake

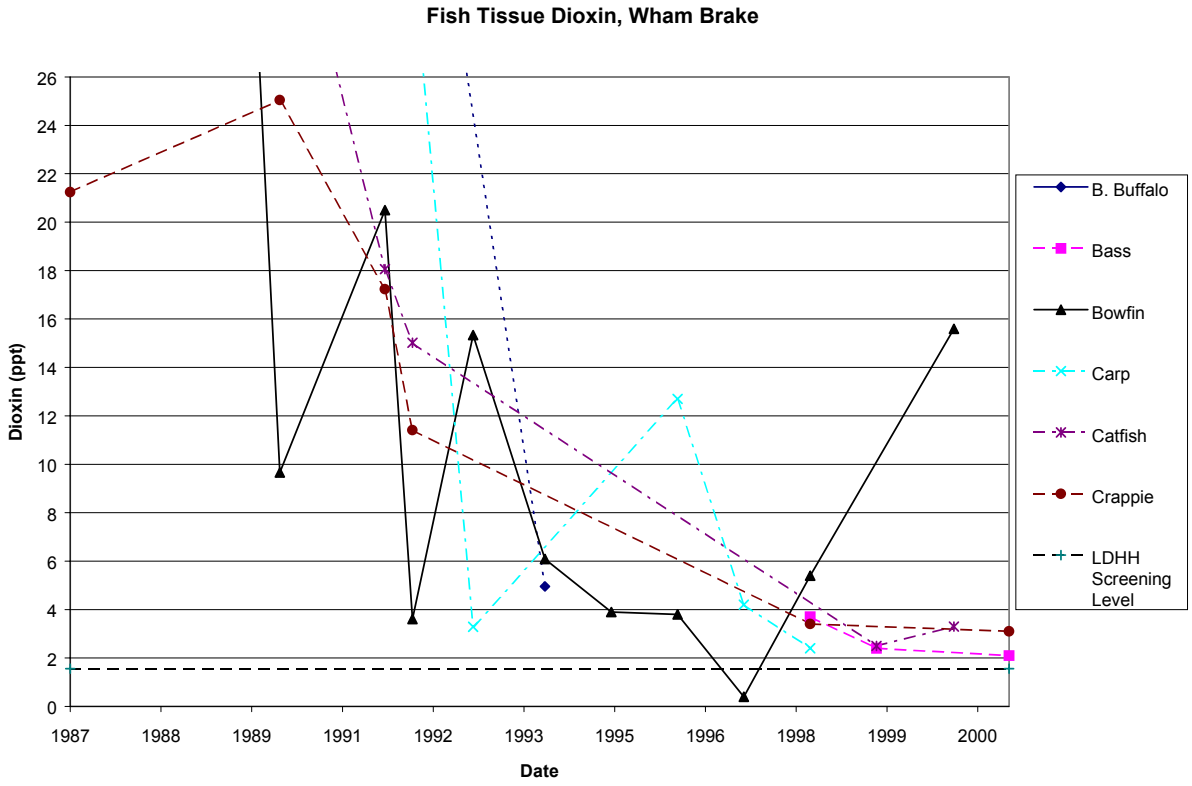


Figure 3.3 Fish Tissue Dioxin, Bayou Lafourche

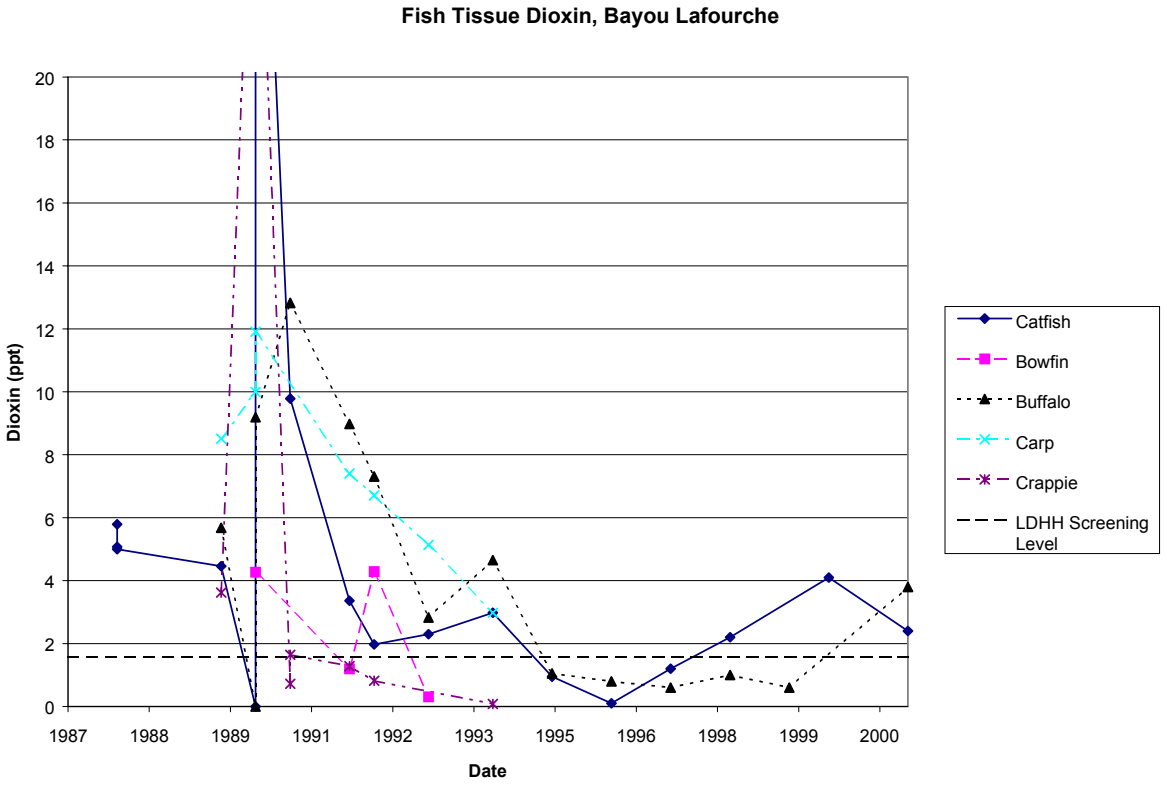
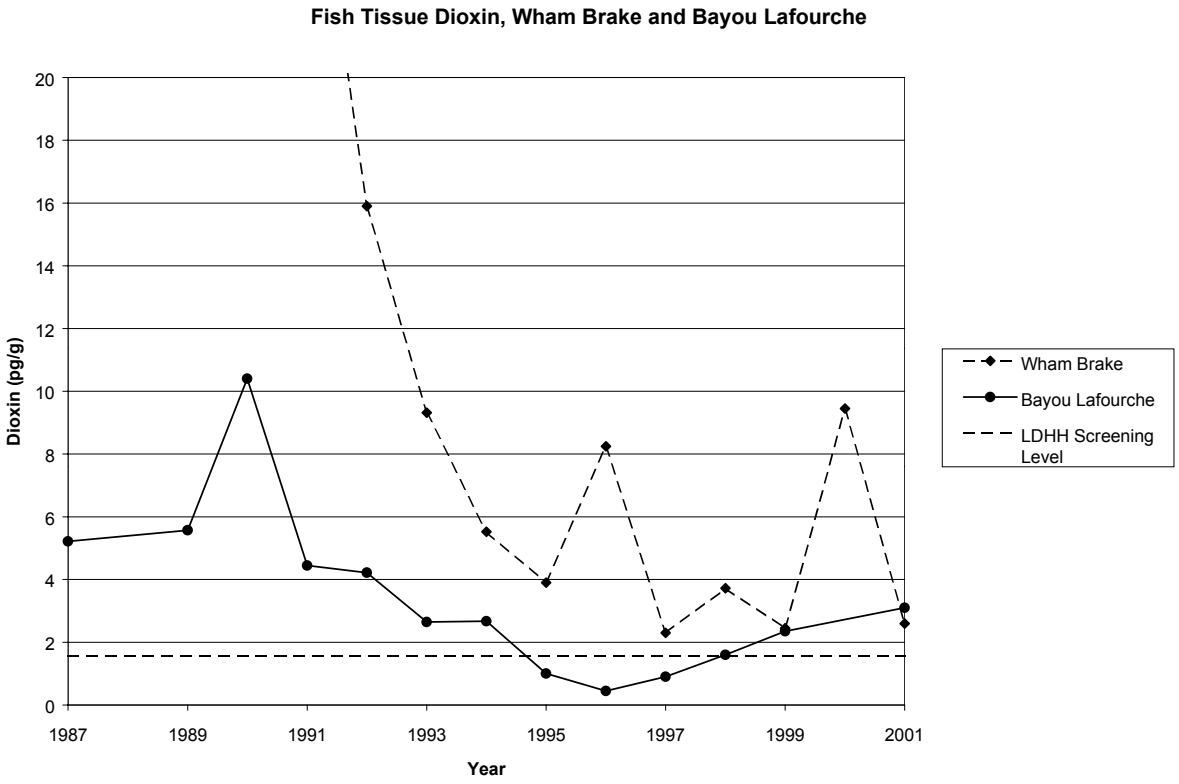


Figure 3.4 Annual Average Fish Dioxin, Wham Brake, and Bayou Lafourche



3.2 ENDPOINT IDENTIFICATION

Water quality standards for the State of Louisiana have been defined in Louisiana Environmental Regulatory Code (LER), Title 33, Part IX (LDEQ 2000). The standards are defined according to designated uses of the waterbodies. Designated uses for Bayou Lafourche-Near Oakridge to Boeuf River near Columbia (Subsegment 080904) include primary contact recreation, secondary contact recreation, and propagation of fish and wildlife. Both general narrative standards and numerical criteria are defined in the State water quality standards. The designated uses for Staulkinghead Creek are secondary contact recreation and limited aquatic life and wildlife use. The numerical criteria for dioxin are shown in Table 3.3. The non-drinking water criterion was used in developing this TMDL because dioxin does not behave conservatively. It is highly hydrophobic and persistent and adsorbs to sediment particles and thus is retained in the system to the extent that sediment particles are retained. Thus, internal resuspension and slow degradation is a factor that should be considered in combination with the ongoing point source load (which appears to be negligible in this particular case).

Table 3.3 Numeric Criteria for Dioxin (LDEQ 2000)

Parameter	Drinking Water Supply	Non-Drinking Water Supply
2,3,7,8-TCDD	0.71 ppq	0.72 ppq

SECTION 4
IDENTIFICATION OF POLLUTANT SOURCES

4.1 BACKGROUND

Dioxins are a group of synthetic organic chemicals that contain 210 structurally related individual chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs). These chemically related compounds vary in their physical and chemical properties and toxicity. They are distributed widely in the environment because of their persistence. Dioxin exposure is associated with a wide array of adverse health effects in experimental animals, including death. The available data do not provide sufficient evidence that dioxins are genotoxic; however, dioxins are classified by the EPA as probable human carcinogens (Group B2). As of 1998, 19 states have issued 59 fish advisories for dioxins. These advisories inform the public that dioxins were found in local fish at levels of public health concern. State advisories recommend either limiting or avoiding consumption of certain fish from specific waterbodies or, in some cases, from specific waterbody types (*e.g.,* all freshwater lakes or rivers) (USEPA 1999).

The following is an excerpt from the 1999 U.S. EPA Fact Sheet on Dioxins:

Sources of Dioxins in the Environment

"Dioxins are formed primarily as unintentional by-products of incomplete combustion and various chemical processes. Although forest fires and possibly other natural sources may produce dioxins, these sources are small compared with anthropogenic sources. Dioxins are produced in small quantities during the combustion of fossil fuels, wood, municipal and industrial waste. Bleaching processes which were used in pulp and paper production produced dioxins, and they occur as contaminants during the production of some chlorinated organic chemicals, such as chlorinated phenols. Currently, the major environmental source of dioxins is incineration. Dioxins have been detected in soil, surface water, sediment, plants, and animal tissue in all regions of the earth. Dioxins are highly persistent in the environment with reported half-lives in soil and sediment ranging from months to years. Because dioxins have very low solubility in water and low volatility, most are contained in soil and sediments that serve as environmental reservoirs from which dioxins may be released over a long period of time. Volatilization and particle resuspension from environmental reservoirs are probably important contributors to global distribution (EPA, 1999)."

4.2 POINT SOURCES

The only identified point source pollutant loading of dioxin is the discharge into Staulkinghead Creek from IP's Louisiana mill (NPDES permit number LA0007561) outfall 001. Table 4.1 shows the facility's permitted effluent limits for dioxin and the permitted and actual discharge flows. The permit is currently under review by EPA Region 6.

Table 4.1 Current Permitted Effluent Limits, Permitted and Actual Discharge Flows (NPDES permit number LA0007561)

Effluent Limit- TCDD	1.1 ppq
Permitted Flow	40.4 cfs
Actual Discharge Flow (2000 & 2001)	31.9 cfs

4.3 NONPOINT SOURCES

No data are available to ascertain whether nonpoint sources of dioxin contribute pollutant loadings within the watershed.

SECTION 5
TMDL CALCULATIONS

5.1 CURRENT LOAD EVALUATION

Since the only known source of dioxin in the watershed contributing to Wham Brake and Bayou Lafourche is IP outfall 001, it is appropriate to establish the TMDL based on critical conditions in Staulkinghead Creek. No water quality data are available to estimate current dioxin loading for point or nonpoint sources. It is assumed that if the TMDL is established based on the assimilative capacity of Staulkinghead Creek, the dioxin loading limits set will be protective of Wham Brake and Bayou Lafourche since both have a greater assimilative capacity.

5.2 WASTELOAD ALLOCATION (WLA)

Dioxin loading was calculated based on the human health dilution equation using harmonic mean flow, effluent flow, and the LDEQ water quality dioxin standard for dioxin of 0.72×10^{-9} milligrams per liter (mg/L). The harmonic mean flow of Staulkinghead Creek was estimated as 25 percent of the estimated average annual flow of 20.6 (Woodward-Clyde 1991). The IP discharge, located in this watershed, has a total permitted design flow of 40.4 cfs (NPDES permit number LA0007561). Thus, calculation of the WLA gives:

Human Health Based TMDL Calculations for Staulkinghead Creek (LDEQ 2000)

$$\textit{\% effluent @ edge of HH MZ} = \frac{Q_E}{Q_E + HM} * 100\%$$

Where:

Q_E = permitted effluent flow (40.4 cfs)

HM = harmonic mean flow of Staulkinghead Creek (5.15 cfs) (Woodward -Clyde 1991)

$$\textit{\% effluent @ edge of HH MZ} = \frac{40.4}{40.4 + 5.15} * 100\% = \mathbf{88.7\ \%}$$

$$WLA = C_{std} * \left(\frac{Q_E}{\%effluent} \right) * unit\ conversion$$

$$\mathbf{WLA = 0.72*10^{-9}\ mg/L * \left(\frac{40.4\ cfs}{0.887} \right) * 5.39* 453{,}592{,}400 = 80.2\ \mu g/day}$$

5.3 POLLUTANT LOAD ALLOCATION

Since there are no adequate ambient environmental data to quantify nonpoint source pollutant loadings, LA is assumed to be zero.

5.4 TMDL

The TMDL calculations include an explicit margin of safety of 20%.

$$TMDL = WLA + LA + MOS$$

Where:

MOS = 0.2 * TMDL

$$\mathbf{TMDL = 80.2 + 0 + 0.2 * TMDL}$$

$$\mathbf{TMDL = 80.2/0.8 = 100.3\ \mu g/day}$$

Table 5.1 shows the results of the above calculations.

Table 5.1 Results

Annual Average Flow	20.6 cfs
Estimated HM Flow	5.15 cfs
7Q10	1.79 cfs
Permitted Effluent Flow	40.4 cfs
	Creek Human Health Effluent Dilution
% Effluent	88.7 %
TMDL Calculations	
Current Load	*
Waste Load Allocation	80.2 µg/day
MOS (20% of TMDL)	20.1 µg/day
Load Allocation	0 **
TMDL	100.3 µg/day

* Unknown current load due to nondetect in effluent over last 5 years.
** No adequate ambient environmental data to quantify nonpoint source pollutant loadings.

5.5 SEASONAL VARIABILITY

Critical low flow conditions were used in developing the TMDL, and there is no load allocation established for nonpoint sources of dioxin; therefore, this TMDL does not incorporate seasonal variability.

5.6 MARGIN OF SAFETY

Federal regulations [40 CFR § 130.7(c)(1)] requires that TMDLs take into consideration a margin of safety (MOS). EPA guidance allows for use of implicit or explicit expressions of the MOS, or both. For the Staulkinghead Creek TMDL, in accordance with LDEQ guidance (Waldon 2000) an explicit MOS was used which would leave a portion of the potential assimilative capacity of the water body unallocated. As stated above, it is assumed that if the TMDL is established based on the assimilative capacity of Staulkinghead Creek, the dioxin loading limits set will be protective of Wham Brake and Bayou Lafourche since both have a greater assimilative capacity. While the water quality criterion for dioxin is designed to protect against bioconcentration (uptake through water) the more conservative approach used in this TMDL will further diminish the probability of bioaccumulation (uptake through water and food) or biomagnification (uptake through trophic levels) in aquatic species. This was done by using an explicit MOS of 20% in the TMDL calculation.

5.7 POLLUTANT LOADING REDUCTIONS

Production processes at the IP Louisiana mill, including ECF bleaching technology, have been in place at least since 1994 and are in compliance with BAT standards. Fish tissue samples have been collected and analyzed on a voluntary basis annually since 1988 for dioxin concentrations, and then as part of IP's permit requirements. Effluent monitoring is also a requirement in the permit; however, an IP representative reported that dioxin Toxicity Equivalent (TEQ) Levels have not exceeded 10 ppq since 1994 (Banker, *personal communication* 2001) (see Appendix B). Through natural attenuation, these aggressive ongoing management measures are expected to reduce dioxin levels over time to levels that will ultimately result in removal of the fish consumption advisories for Wham Brake and Bayou Lafourche.

5.8 FUTURE WATER QUALITY MONITORING

Yearly fish samples will continue to be collected from the same two separate locations, one at Wham Brake and another at Bayou Lafourche (see figure 3.1) to assess dioxin levels. Effluent sampling for dioxin is also expected to be continued as part of the IP permit requirements. A one-time fish collection sampling event may also be appropriate for Staulkinghead Creek sometime in the future to verify the continuation of the declining trend in dioxin concentrations.

SECTION 6
PUBLIC PARTICIPATION

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comments concerning the TMDL. EPA prepared this TMDL pursuant to the consent decree, Sierra Club, et al. v. Clifford et al., No. 96-0527, (E.D. La.) signed and entered on

April 1, 2002. Federal regulation requires that public notice be provided through the Federal Register and through newspapers in the local area. The Federal Register notice was issued on March 29, 2002 (Volume 67, Number 61, pages 15196 – 15198). This TMDL was also noticed in local newspapers including the Lake Charles American Press and New Orleans Times-Picayune. Comments and additional information were submitted during the 30-day public comment period and this TMDL has been revised accordingly. Comments and responses are made available in Appendix C. EPA will provide notice that this TMDL has been made final, to the court, and to the Louisiana Department of Environmental Quality (LDEQ) along with a request that it be incorporated into LDEQ's current water quality management plan.

SECTION 7
LIST OF REFERENCES

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Woodward-Clyde. 1991. An Examination of Low Flow Conditions in Staulkinghead Creek, Louisiana. Report for International Paper Company, Bastrop, Louisiana.

APPENDIX A
FISH CONSUMPTION ADVISORY

For a copy of Appendix A, please contact Linda Adams by phone at 214-665-6546 or by email at adams.lindak@epa.gov.

APPENDIX B
INTERNATIONAL PAPER - PERSONAL COMMUNICATION

Dioxin Data Collected By IP-Bastrop

Dioxin test results were obtained using EPA 1613 test procedure or the equivalent NCASI procedure. The tests were run using appropriate blanks, replicates and spikes according to the established QA/QC procedures for the test method. The fish data were composite samples of 3 to 10 fish (mostly 5 or 6 fish per sample with some exceptions) with a target collection of as similar a size as practical (within +/- 15 % length of each fish in a target species). Triangle Lab made tests through 1998, and after that ALTA Lab made tests. The % lipid, weights, and lengths of the fish samples are being compiled from the raw data files and will be sent as soon as completed. The fish samples were tested on a wet weight basis (as is).

Dioxin precursors were eliminated in 1998/9 from defoamers used at the Louisiana Mill. In 1992, the Chlorine Dioxide substitution in the bleach plant was increased from 5 % to 50 % Chlorine Dioxide by maximizing ClO2 production. In 1994, the substitution was increased to 100 % when the bleach plant was converted to elemental chlorine free (ECF). Installing a larger ClO2 Generator and eliminating the use of elemental chlorine achieved this.

The effluent from the Louisiana Mill was tested as part of the 104 Mill Cooperative Study between Industry and the EPA in 1988. The study was coordinated by NCASI. The effluent dioxin concentration from that study for the Louisiana Mill was:

2378 TCDD = 330 PPQ
2378 TCDF = 1600 PPQ
TEQ = 2378 TCDD + (0.1) 2378 TCDF
TEQ = 490 PPQ

This was one of the highest effluent results in the United States. Since 1994, the dioxin concentration in the effluent has been non-detect at 10 PPQ or less than 10 PPQ.

Dioxin in the Louisiana Mill primary clarifier sludge in the 104-mill study from 1988 was:

2378 TCDD = 140 PPT
2378 TCDF = 677 PPT
TEQ = 207.7 PPT

Dioxin in the Louisiana Mill primary clarifier sludge in 1999 was:

2378 TCDD = 0.22 PPT
Total TCDD = 2.1 PPT
2378 TCDF = 0.33 PPT
Total TCDF = 1.7 PPT
TEQ = 0.34 PPT

If there are any more questions, please contact me at 318-556-1466 or e-mail kernan.banker@ipaper.com.

Kernan Banker
11/16/01

APPENDIX C
PUBLIC COMMENTS AND EPA RESPONSES

FORMAL PUBLIC COMMENT LETTER SUBMITTED BY LDEQ EMELICE CORMIER, TECHNOLOGY DIVISION (DATE: APRIL 29, 2002)

DIOXIN

Ouachita River Basin TMDLs for Dioxin (Subsegments 080900, 080904, 080912)

1. Treating Dioxin as a conservative conflicts with the report's premise that dioxin becomes interlocked in the sediments. A more appropriate modeling option should be used. LDEQ was given 98 EPA TMDLs within a single 30 day review period. Unfortunately a through review of modeling options could not be performed. LDEQ suggests additional review as to appropriate modeling methods for Dioxin. We would appreciate being included in the discussions.

EPA Response

While it is certainly true that Dioxin readily attaches to particulates and, as a result, is transported to the sediments, it also readily moves back into the food chain from the sediments. Since it is likely that the bulk of the movement into the food chain occurs from concentrations in the sediment, a more holistic approach is warranted. Removal of Dioxins from the water column to the sediments does not imply that the compounds are unavailable for biotic uptake. The EPA criterion is a water column concentration limit derived with the intention of limiting the accumulation of Dioxins in fish tissue. It only serves as an analog to calculate Dioxin loadings where biotic uptake may exceed fish tissue concentration limits. There are many more sophisticated methods available for modeling the transport of pollutants such as Dioxins; however, the data to support these more intensive efforts do not presently exist for the effected area and the time limitations imposed by the court case preclude the collection of these data. Therefore, it is necessary for EPA to maintain the TMDL calculation for dioxin as proposed and rely on the approach in Section 5.

2. There is no subsegment 080900. Little Bayou Boeuf/Wham Brake are included within Subsegment 080904 and should be included in its TMDL. Please remove the 080900 descriptions from the report.

EPA Response

EPA concurs with LDEQ that there is no subsegment 080900. However, the TMDL report will still need to refer to Little Bayou Boeuf/Wham Brake by name since it is specifically identified on the 1999 court order list in this manner.

3. Separate TMDLs should be determined for subsegments 080912 and 080904. Subsegment 080904 has a greater assimilative capacity than 080912 and could have additional point sources that should be addressed with wasteload allocations. Additional research for contributing facilities should be done in subsegment 080904.

EPA Response

As a basis of its strategy, EPA stated in the TMDL report that: "Since the only known source of dioxin in the watershed contributing to Wham Brake and Bayou Lafourche is IP outfall 001, it is appropriate to establish the TMDL based on critical conditions in Staulkinghead Creek. No data were available to estimate current dioxin loading for point sources or nonpoint sources. It is assumed that if the TMDL is established based on the assimilative capacity of Staulkinghead Creek, the dioxin loading limits set will be protective of Wham Brake and Bayou Lafourche since both have a greater assimilative capacity."

However, a separate TMDL could be determined for Bayou Lafourche (Subsegment 080904) if the need arises in the future.

4. The margin of safety was incorrectly calculated, thus determining an incorrect TMDL value. First a 25% MOS was used, it is LDEQ standard protocol to use a 20% MOS. Second the TMDL, when treating the parameter as a conservative, should be calculated from the criteria and critical flow. The MOS can then be subtracted to determine the WLA and LA portions. The value the contractor listed as the TMDL is in reality the TMDL minus the MOS (i.e. WLA + LA). The reported TMDL should be equal the sum of the WLA, LA and MOS.

EPA Response

EPA acknowledges LDEQ's concern regarding margin of safety. The TMDL has been recalculated using a 20% MOS (see pages 5-1 to 5-3) as recommended in LDEQ's guidance document "Louisiana Total Maximum Daily Load Technical Procedures, 1994".

FORMAL PUBLIC COMMENT LETTER SUBMITTED BY INTERNATIONAL PAPER, GREG VAN VOORHIS, MANAGER, LOUISIANA MILL (DATE: APRIL 26, 2002)

COMMENT

We object to the use of an estimated harmonic mean flow value as the basis for establishing the pollutant load allocation for dioxin in Staulkinghead Creek. Because the Louisiana Department of Environmental Quality (LDEQ) has designated Staulkinghead Creek Segment (080912) intermittent, it is our belief that using the receiving stream long-term average flow is more appropriate for this purpose.

Specifically, based upon recommendations contained in a use attainability analysis conducted by the LDEQ in 1994, Staulkinghead Creek was declared intermittent (Attachment A). The designated uses and water quality standards for this stream segment were modified accordingly (i.e., secondary contact recreation and limited aquatic life and wildlife use). We submit that this provides the basis for using an alternative to the 7Q10 statistic for establishing WQBELs for Staulkinghead Creek, as authorized by Louisiana Administrative Code (LAC) 33: IX. 111 5.C.7. a, b, and c:

> a. Chronic aquatic life criteria apply outside the mixing zone, beginning at the edge. The 7Q10 is specified in Table 2a with the intention of limiting 7-day average concentration exceedences to no more than once every 10 years.
>
> b. In perennial flowing streams (Table 2b, Categories 1 and 2), harmonic mean flow is specified for human health protection against carcinogens, and the 7Q10 is specified for human health protection against non-carcinogens.
>
> c. These specified flows will not be appropriate under some circumstances, and alternative formulations will be required to determine appropriate effluent limitations for equivalent protection of human health and aquatic life uses of the stream. These exceptions may include, <u>but are not</u> limited to (emphasis added), seasonally variable effluent discharge rates, hold and release treatment systems, and effluent dominated sites. The office may approve an alternative which is protective of designated uses, to be determined on a case-by-case basis."

For Staulkinghead Creek, an alternative to the harmonic mean flow statistic for human health protection is clearly appropriate. We submit that the only appropriate statistic in this case is the long-term average (LTA). The Draft TMDL Report (Draft Report) references a study prepared by Woodward Clyde Consultants (WCC) in 1991 as the source for the statement that no stream gauge exists in Staulkinghead Creek. However, the Draft Report fails to mention that the purpose of the WCC report was to evaluate low flow conditions in order to establish a dilution flow value for Staulkinghead Creek. The report concluded that statistically, the LTA value was the most appropriate flow for that purpose.

In the 1994 LDEQ use attainability analysis, the only fish species collected in Staulkinghead Creek was mosquitofish (*Gambusia affinis*), a species tolerant of low flow and poor water quality conditions. Because higher trophic-level species are not present within the immediate vicinity (and probably not for some distance downstream), the potential for biomagnification in this area is reduced. This, in addition to the intermittent natural conditions, supports the use of the LTA value for calculating the pollutant load allocation for dioxin.

Last year, the United States Court of Appeals for the Fifth Circuit ruled that intermittent streams do not qualify as navigable waters, and as such, are not subject to regulation under the Clean Water Act (Rice v. Harken Exploration Co.). We suggest that it may be altogether inappropriate to establish a TMDL for Staulkinghead Creek, and instead, focus on the discharge from Wham Brake. This is supported by the fact that the fish consumption advisory issued by the Louisiana Department of Health and Hospitals (LDHH) only addressed Bayou Lafourche and Wham Brake.

EPA RESPONSE

EPA has evaluated the information provided; however, the estimated harmonic mean flow must be used per LDEQ regulations (Title 33, Environmental Regulatory Code, Part IX, 1113).

COMMENT

Five additional comments concerning the draft are:

1. On p. 2-1 summertime overtopping of Wham Brake has only occurred twice in the past 30 years. Therefore the phrase "once every few years at most" should be removed.

EPA RESPONSE

The phrase will be removed.

2. a) USEPA should present the MOS as the percentage reduction of the load in this case 25%; and
   b) a 20% reduction (or an 80% multiplying factor) is consistent with other TMDLs for Louisiana streams (including fish advisory driven TMDLs for mercury) USEPA should use an MOS of 20%.

EPA RESPONSE

EPA acknowledges IP's concern regarding margin of safety. The TMDL has been recalculated using a 20% MOS (see pages 5-1 to 5-3) as recommended in LDEQ's guidance document "Louisiana Total Maximum Daily Load Technical Procedures, 1994".

3. USEPA's recommendation of fish sampling in Staulkinghead Creek (p. 5-3) is inappropriate given the LDEQ stream study.

EPA RESPONSE

Fish tissue data is lacking for this stream. EPA considers the recommendation for additional fish sampling to be reasonable and relevant since the stream represents the immediate receiving water for the facility discharge. The TMDL indicates that a one-time sampling of fish would be appropriate to evaluate the presence or absence of bioaccumulation, assuming an adequate fishery is present to sample. This data will be weighted along with data for fish tissue in Wham Brake and Bayou Lafourche in deciding whether to revise, continue or discontinue the fish tissue sampling program.

4. USEPA should acknowledge that in the future, upon LDHH lifting of the fish consumption advisory for dioxin, the segment will be delisted and the TMDL rescinded.

EPA RESPONSE

Fish consumption advisories are rescinded once the state determines that the risk to human health is not significant. However, TMDLs are not typically rescinded once they are established for a waterbody, even when the waterbody is delisted. In the future, determinations could be made on the need to revise or update the TMDL to reflect current conditions.

5. The year provided on pp. ES-2 and 5-3 for which the Louisiana Mill modified its process to become ECF should be changed from 1998 to 1994.

EPA Response

EPA concurs and will change the year in the TMDL report.